EXHIBIT RR

Report on the 2017 CSO and 2017 CSO Preferred Structure Table Development

Joint American Academy of Actuaries' Life Experience Committee and Society of Actuaries Preferred Mortality Oversight Group
CSO Development Subgroup

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Executive Summary

At the request of the NAIC, the Society of Actuaries (SOA) and the American Academy of Actuaries (Academy) have collaborated to create new Valuation Basic Tables (VBT), Relative Risk tables (RR), and Commissioners Standard Ordinary Mortality Tables (CSO).[1] The current CSO table was created in 2001 based on experience from 1990-1995 and thus, is at least 20 years old. Since that time, industry experience studies performed by the Society of Actuaries Individual Life Experience Committee (ILEC) have shown significant improvement in the mortality rates experienced by the industry from that underlying the 2001 CSO table development. In addition, at the time the 2001 CSO was developed, there was limited experience with respect to mortality differentials for polices underwritten in a preferred underwriting regime. A significant portion of the newly issued policies go through a preferred underwriting regime. Therefore, the NAIC's Life Actuarial Task Force (LATF) charged the Joint American Academy of Actuaries Life Experience Committee and Society of Actuaries' Preferred Mortality Oversight Group (Joint Committee) to develop a new valuation mortality table to correspond to the experience underlying the 2015 VBT and RR Tables.

The following chart describes the anticipated uses of these tables:

Table	Regulatory Use
2017 CSO	• CRVM • Net premium reserves • Non-forfeiture determination • Cap for universal life cost of insurance charges
2017 CSO Preferred Structure Tables	• CRVM • Net premium reserves

The Joint Committee started with the 2015 Valuation Basic Table (2015 VBT) as the underlying basic mortality table for the 2017 CSO. The 2015 VBT was developed based on the mortality experience from the SOA Individual Life Experience Committee studies from the 2002-2009 study period. Additional data from other sources was used to supplement the 2002-2009 experience at younger and older ages where industry experience was sparse. To develop the 2015 VBT table, the mortality was projected to the year 2015 using recent mortality improvement trends. LATF did not intend for the CSO table to be effective until the operative date of the Valuation Manual for use under Principle-based Reserves (PBR). Therefore, the charge to the Joint Committee requested the unloaded VBT mortality to be further projected from 2015 to 2017, the expected operative date of the Valuation Manual. The Joint Committee used the same projection improvement factors to project the mortality rates from 2015 to 2017 as were used to project the VBT from 2009 to 2015. The improvement factors were applied prior to the addition of any loading factors. Information regarding the development of the 2015 VBT and the determination of the mortality improvement factors may be found in the documentation for the 2015 VBT http://www.soa.org/Research/Experience-Study/Ind-Life/Valuation/2015-valuation-basic-tables.aspx. The improvement factors are provided in Appendix G. Mortality Projection Factors for 2015 to 2017.

The 2017 CSO consists of a series of tables that split the overall mortality results into more granular components. The structure of the tables is identical to the 2001 CSO in the following ways:

- Terminal age of 121
- Composite (not tobacco distinct) tables begin at age 0
- Tobacco distinct tables (Non-tobacco and tobacco) begin at issue age 18
- Non-tobacco tables are further sub-divided into super-preferred, preferred, and residual standard classes
- Tobacco tables are further divided into preferred and residual standard classes

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The direction from LATF was to develop a mortality loading such that:

(1) *The purpose of the margin is to cover the variation of individual company's mortality around the mean (i.e., company variation); and*
(2) *The loading should result in a mortality level that covers the claims or mortality experience from at least 70% - 79% of the contributing companies (in the underlying mortality study.*

The Joint Committee recommended a loading formula and methodology to apply to the 2015 VBT that met the overall goal for loading established by LATF. The use of the term 'loading' refers to additions to the mortality rates in the 2015 VBT such that the 2017 CSO Table provides for an adequate level of mortality for most companies as evidenced by their portion of the data contributed.

The loading formula is in a different form from what has historically been used for the prior two CSO tables. The proposed loadings in the 2017 CSO are a percentage of the unloaded mortality rates where the percentages vary by attained age. The percentage load factors, prior to grading the mortality rates to 1,000 per 1,000 at attained age 120, are 23% below attained age 20, grading down to 16.85% at attained age 80, further grading down to 14.80% by attained age 100 and grading to an ultimate load factor of 7.62% at attained ages 110 and above. While the percentage load decreases as age increases, the resulting per 1,000 loads generally increase as age increases. The absolute level of loading resulted in a load which covered the mortality of at least 70.6% of the companies who contributed experience data for the underlying studies.

The proposed 2017 CSO table was examined at a high level for consistency to the 2001 CSO table and to the underlying VBT table by the Joint Committee. The Joint Committee calculated sample net premium reserve values for sample ages for a 20-year term plan and a whole life plan. Reserves were calculated using both select and ultimate as well as ultimate only mortality and examined for appropriate relationships. Results of this testing are shown in Appendix H – Whole Life CRVM Mean Reserve Comparison and Graphs, Appendix I – Whole Life Net Single Premium Comparisons, and Appendix J – 20-Year Term CRVM Regulation XXX Mean Reserve Comparison and Graphs. A more thorough examination of reserve patterns and changes in absolute reserve levels was performed by Milliman in an impact study jointly commissioned by the SOA and ACLI. The link to the final report on that impact study can be found here: http://www.soa.org/Research/Research-Projects/Life-Insurance/research-cso-impact-study.aspx.

The proposed 2017 CSO table is based on recent mortality experience and is intended to provide a minimum standard for the valuation of standard ordinary life insurance. However, this standard may not produce adequate reserves in all cases. For example, those companies with limited underwriting-simplified issue, guaranteed issue, or simply less underwriting intensity than is the norm for the business, may find that the proposed 2017 CSO Table does not provide adequate reserves. The proposed table is based, both in the development of the level of mortality and in the testing of loads, primarily on experience from companies contributing data to the SOA. As such, an individual company may have mortality that is materially different from the proposed 2017 CSO Table.

The Joint Committee recommends that the proposed 2017 CSO Table, including the 2017 CSO Preferred Structure Tables, be adopted for use as a statutory valuation table to replace the 2001 CSO Table and 2001 CSO Preferred Structure Tables currently mandated for statutory reserve calculations. The new table is consistent with recent available experience and will result in reserves (CRVM; excluding deficiency reserves) that overall are approximately 5%-10% lower for WL plans and roughly 30% lower for level term plans.

Introduction

The experience underlying the 2001 CSO table is from calendar years 1990-1995. Since that time, industry experience studies performed by the Society of Actuaries Individual Life Experience Committee (ILEC) have shown significant improvement in the mortality rates experienced by the industry from that underlying the 2001 CSO table development. In addition, at the time the 2001 CSO was developed, there was limited experience with respect to mortality differentials for polices underwritten in a preferred underwriting regime. A significant portion of the newly issued policies go through a preferred underwriting regime. Therefore, LATF requested the Joint Committee develop a new valuation mortality table to correspond to the experience underlying the 2015 VBT and RR Tables. As is shown in the report on the creation of the 2015 VBT, current mortality levels are considerably lower than the mortality levels underlying the 2001 CSO Table. The current valuation mortality standard generally produces reserves, excluding deficiency reserves, that overall, are materially higher than those produced by the proposed 2017 CSO Table.

At the request of LATF, the Joint Committee developed a proposed set of mortality tables intended to replace the 2001 CSO Table and the 2001 Preferred Structure Tables currently required for determination of CRVM reserves.

The Joint Committee divided this work into two phases: the construction of valuation basic tables, and the development of an appropriate loaded valuation table(s). The Valuation Basic Table Subgroup of the Joint Committee first developed the 2015 VBT and 2015 VBT Relative Risk Tables, a set of graduated experience tables suitable for use as the basis for a valuation table. The CSO Subgroup of the Joint Committee then performed the following:

a) Considered and recommended the purpose of the loading;
b) Analyzed and recommended the structure of the loading to accomplish the directive of NAIC's LATF in terms of company coverage;
c) Developed and considered loading structure for the preferred structure tables, with input from the American Council of Life Insurers (ACLI) in terms of the number of tables and desire to meet certain requirements;
d) Determined the appropriate relativity of the unloaded tables to subdivide the NS/NT table into three non-tobacco classes and to subdivide the SM/TB table into two tobacco classes; and
e) Performed an initial review of reserves described in this report.

The resulting 2017 CSO Table and 2017 CSO Preferred Structure Tables (2017 CSO Tables), are shown in Appendices A, B, C, D and E. Separate non-tobacco, tobacco, and composite (non-tobacco/tobacco combined) tables were developed for males and females resulting in a total of six tables. Each table has values for a 25-year select period and for ultimate ages. Both age-nearest and age-last birthday tables have been developed. Preferred Structure tables (3 non-tobacco; 2 tobacco) have also been developed.

This report describes the work performed by the team in developing this table. Additional details are provided in the appendices.

Basis for the 2017 CSO

The Joint Committee's Valuation Basic Table Subgroup created the 2015 Valuation Basic Table (2015 VBT) as the underlying unloaded table.

The 2015 VBT is based on 2002-2009 industry experience that has a very large volume of data and is a significant increase in exposure and number of claims over the studies underlying both the 2008 and 2001 VBT

table development. The 2015 VBT was based on the data from 51 contributing companies who contributed $30.7 trillion of exposure by amount, 266 million policies, and 2.5 million claims. The following table compares the amount of experience underlying the 2017 CSO to that underlying the 2001 CSO and 1980 CSO.

	1980 CSO	2001 CSO	2017 CSO
Achieved Coverage %	50%	81%	70.6%
# companies experience included	19	21	51
# Companies Covered	10	17	36
Amount of data in underlying study			
Exposure by Amount	$0.77 trillion	$5.7 trillion	$30.7 trillion
Exposure by Count	Not provided in report	175 million	266 million
Actual # Claims	Not provided in report	1.25 million	2.5 million
# Common Companies to 2017 CSO	14	16	N/A
# Unique Companies Underlying	5	5	37

The 2015 VBT consists of both Primary tables and Relative Risk (RR) tables. The primary tables consist of the following table structures:

- Male and Female;
- Tobacco,* Non-tobacco,* and Composite;
- Age nearest birthday and age last birthday;
- Select and ultimate with select factors that vary by gender and issue age and persist for 25 years for issue ages 18-55 grading down at the higher issue ages;
- Juvenile rates are on a Composite and Ultimate basis only; and
- An omega rate of 500 per 1,000 with no omega age.

The RR tables are similar in form and reflect a range of expected mortality from preferred underwriting regimes ranging from super-preferred to residual standard. Ultimately, there are 10 non-tobacco and four tobacco tables for each gender, issue age basis (age nearest/age last birthday), and select and ultimate / ultimate table combinations. The RR tables are not available on a Composite basis or for juvenile ages.

The final Primary (and RR) tables were improved to 2015. Actual mortality experience underlying the table is from exposure periods 2002-2009; actual experience during that period was use to project the experience from each experience year to 2009. The table was further improved to 2015 based on the average annual improvement rates implied by the Social Security Administration general population data.

For more information on the 2015 VBT tables and their development see this link:
https://www.soa.org/Research/Experience-Study/Ind-Life/Valuation/research-2014-vbt-report-acc-table.aspx

Subsequently, at the NAIC Summer 2014 National Meeting NAIC leadership changed the planned operative date of the Valuation Manual from 2016 to 2017. Based on this action, it was suggested that the rates be projected forward two more years to 2017 to coincide with the new expected PBR operative date. This new table is referred to as the 2017 Unloaded CSO. The same projection rates as were used to project from 2009 to 2015 were used to advance the table two additional years. See Appendix G – Mortality Projection Factors for 2015 to 2017 for the projection factors used.

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* Nonsmoker and Nontobacco used interchangeably as are Smoker and Tobacco

After the mortality improvement and prior to the addition of any loading, monotonicity checks were performed on the final unloaded tables to assure morality rates behaved as expected (increasing by issue age, attained age, males greater than females, tobacco greater than non-tobacco). Because greater mortality improvement was used for males than for females to bring the tables from the study period up to 2017, some cells needed to be adjusted. The number of cells needing a manual adjustment was minimal. Documentation of the process used can be requested by contacting Cynthia MacDonald at the SOA at cmacdonald@soa.org. The same monotonicity checks were then re-performed once the loading was applied; no further adjustments were necessary.

Development of the Preferred Structure Tables

Upon completion of the 2017 Unloaded CSO table, the Joint Committee began the development of the 2017 Preferred Structure Tables. Based on industry and regulator input, the following characteristics of these tables were preferred:

- No more than three non-tobacco tables, preferably using the three NS/2 SM structure within the 2001 CSO Preferred Structure Tables;
- The three NS tables, prior to addition of the load, aggregate back to the 2017 Unloaded CSO NS table;
- The two SM tables, prior to addition of the load, aggregate back to the 2017 Unloaded CSO SM table; and
- Must have an omega age rather than an omega rate – preference for the omega age to be the same as the 2001 CSO at 121.

The first step in developing the preferred structure tables was to analyze the preferred experience underlying the 2015 VBT from the Individual Life Experience Committee for business that was issued under a preferred underwriting regime. Business for nonsmoker risks with 3 or more classes was limited to issues since 1990, which resulted in little to no data beyond duration 15. Similarly, business for smoker/nonsmoker risk structures was limited to issues since 1980.

As the data collection for earlier exposure years did not consistently capture preferred risk class indicators and risk class differentiation indicator (e.g., super preferred, preferred), the Joint Committee focused on preferred experience issued under a structure with three or more NS classes from the 2005-2009 data collection.

Next, the various preferred underwriting classes were mapped into the desired number of tables being developed (three class structures were mapped directly; four class structures were mapped so that the best class mapped to Super Preferred, the 2nd best class mapped to Preferred, and the 3rd and 4th classes mapped to the residual standard, etc.)

Actual to expected ratios were then calculated for the underlying experience using all available durations and by aggregating male and female data.

The Relative Risks of each class were determined using the combined male and female actual to expected ratios from the previous step and using those ratios to determine the appropriate RR table—taking a weighted average of two tables if necessary. For example, if the A/E was 72%, 80% of the RR70 table and 20% of the RR80 table was used. The following table shows the resulting relative risk by class and prevalence:

Relative Risk and Prevalence by Preferred Structure Class

	Risk (by A/E)	(by Face Amount Exposed)	(by amount expected claims)
Super Preferred NS (Class 1)	77%	40%	24%
Preferred NS (Class 2)	98%	27%	27%
Residual NS (Class 3)	120%	32%	49%
Preferred SM	87%	64%	55%
Residual SM	119%	36%	45%

The tables were checked to assure that the three NS tables aggregate back to the unloaded NS table and the two SM tables aggregate back to the unloaded SM table. As an example, for male non-tobacco, this check was performed by adding the expected claims for Super Preferred, Preferred, and Standard classes and making sure they roughly equal the expected claims for the 2017 VBT male, non-tobacco table. This test was performed independently for male non-tobacco, female non-tobacco, male tobacco, and female tobacco. For all four categories combined the total expected claims were within 0.0375% of the total amount exposed and no further adjustments were deemed necessary.

Finally, factors were developed using the ratio of the Relative Risk table for each preferred class to the underlying RR 100 table. These factors were applied to the 2017 Unloaded CSO table to create 2017 Unloaded Preferred Structure CSO tables.

Development of the Loading Factors

Purpose of Loads

In developing the final 2017 "loaded" CSO table, the Joint Committee first considered the purpose of having margins or loads in valuation mortality rates.

First, loads may be necessary because of low credibility or confidence in the underlying experience data. Given the 439% increase in exposure by amount compared to the studies underlying the 2001 CSO, loads due to low credibility were deemed unnecessary.

A second reason for loading is to cover random fluctuation in mortality results. As a percentage of unloaded mortality, these loads would theoretically vary by company size, but it was deemed to be impractical to vary the loading by exposure or company size. In addition, capital and surplus held by companies should be sufficient to cover this risk.

Loading may also be used to cover unknown variation such as due to catastrophic events. It was felt that this also should be covered by capital and surplus.

The last use of loading that was analyzed was variation in individual company's experience relative to the mean of all companies. The Joint Committee felt (and proposed to LATF) that the loading should make provision for this risk especially due to the considerable variability of results by company. In the experience data used, the actual to expected ratios for non-tobacco risks range from 40% to over 1000%.

Guidance from LATF

From the start, LATF provided guidance on the purpose, amount and level of the load. LATF agreed that the purpose of the load was to cover variation in individual company's mortality around the mean, and suggested the loads should be consistent with those in the 2001 CSO table and that they should be large enough to cover the mortality of 70-79% of the 51 contributing companies in the underlying data. The Joint Committee analyzed the underlying contributing company experience and aggregate margin levels required to cover specified percentages of the contributing companies to the 2002-2009 studies. This analysis looked at company coverage for experience by both amount and number of claims; however, the Joint Committee focused the target margin level and company coverage to experience by amount of claims.   Based on this analysis, the Joint Committee initially recommended a load of roughly 15% as a good starting target to meet the 70% to 79% contributing company coverage goal for NS risks and that a slightly higher target was likely necessary for SM risks. The analysis is shown in the charts below:
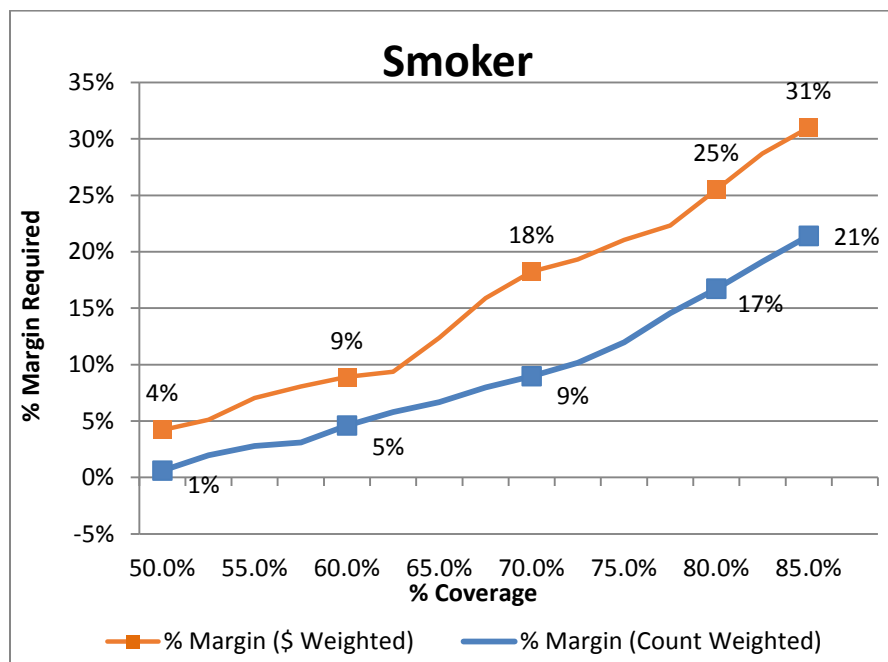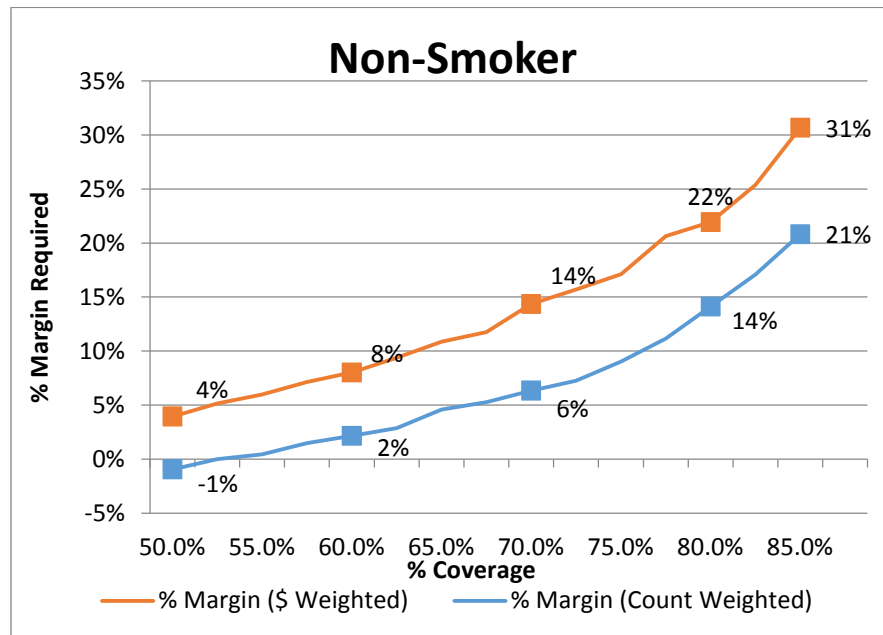
Structure of Load

In both the 1980 CSO and 2001 CSO, the load was established as an inverse function of the curtate expectation of life. The actual formula used for the 1980 CSO and 2001 CSO tables is shown in the table below:

CSO Table	Underlying Experience	% Companies Covered by Margin	Structure of Margin
80 CSO*	1970-1975	Over 50%	$\dfrac{0.35 - 0.00025x + 0.000009x^2}{e_x}$
2001 CSO**	1990-1995	70% - 79%	$\dfrac{0.0056 - 0.00016(x + t) + 0.00008(x + t)^2}{e_{[x]+t}}$
2001 CSO Preferred Structure	1990-1995	Same as 2001 CSO	Same as 2001 CSO
2017 CSO	2002 - 2009	70% - 79%	Graded flat % varying by attained age

*   Margins were calculated for the composite ultimate rates and then used for both SM & NS ultimate rates.
** The formula margin for attained age 100 was graded to 0 at attained age 120

In the 1980 CSO formula, **x** represents the attained age; in the 2001 CSO formula, [x] represents issue age, t represents the number of durations since issue, (x+t) represents attained age and $e_{[x]+t}$ is the curtate expectation of life based on the 2001 VBT. In each of the 1980 CSO and 2001 CSO formulae, the coefficients were iteratively solved to assure loads were kept at reasonable levels by age while meeting an overall 15% goal. Although the composite, male, ultimate table was used to develop the loading formula, the same loading formula was then used for tobacco, non-tobacco, males, females, and durations in both the select and ultimate period.

One of the issues with the formulaic approach is that it resulted in extremely high margins during the early durations of the select period—sometimes as high as 65%--where there are often the highest levels of credibility.   A few potential reasons for this might be that the margins were based on ultimate mortality and the underlying tables were based on studies with considerably less exposure in the select period.

Select Period Load in 2001 CSO Table (as a percentage of the 2001 VBT) Issue Age 35, Male, Non-smoker
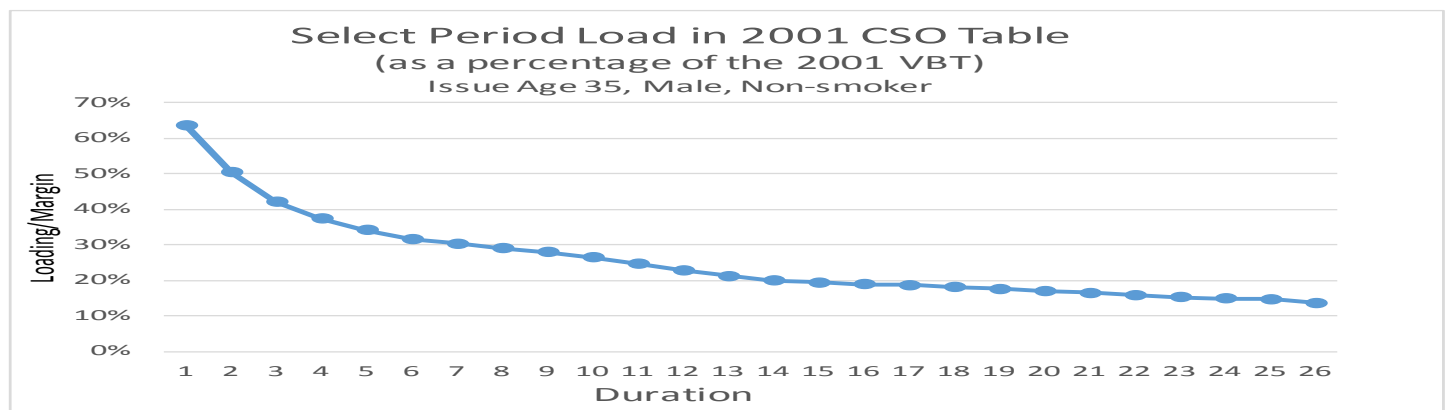
Carrying the 2001 CSO loading methodology forward and adjusting the parameters in order to meet the targeted company coverage requirement from LATF's charge resulted in a pattern of loading similar to that shown in the chart above. The Joint Committee observed that a the formulaic load structure similar to that used for the 2001 CSO results in margins that are considerably higher at the ages where the underlying experience had the highest credibility.   Note, the prior analysis was performed on the 2014 VBT, prior to it being projected forward to 2015 and then to 2017.
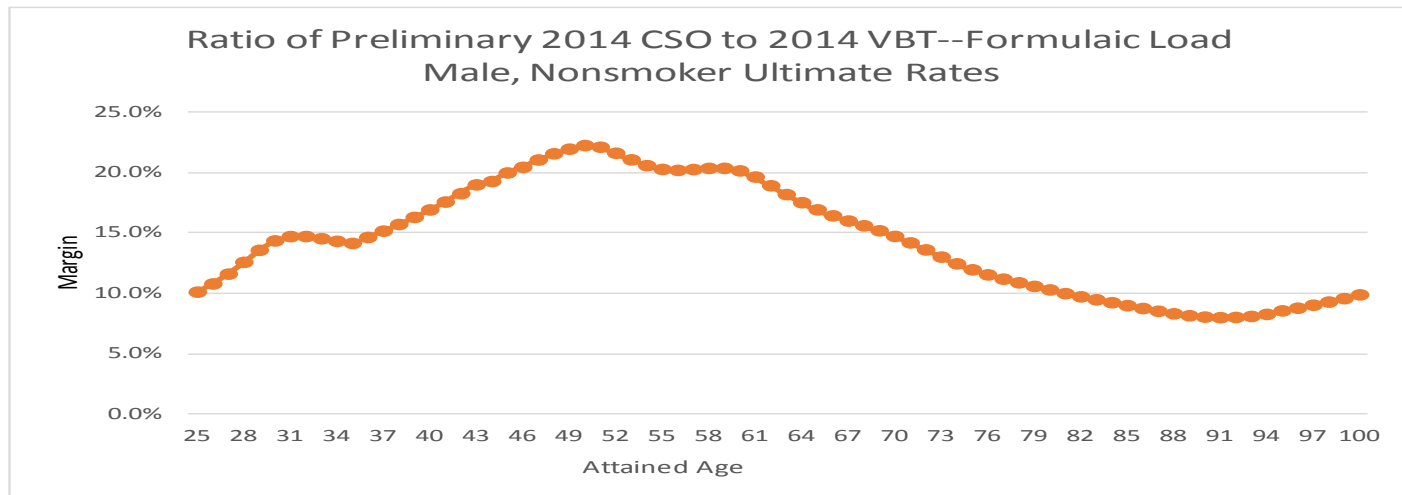
In addition to a loading formula like that used for the 2001 CSO producing unreasonably high loads for some issue age/duration combinations, the Joint Committee felt that because of the numerous tables that are being produced as part of the 2017 CSO (especially considering all the preferred structure tables) a simpler load should be developed. The table below demonstrates the pattern of the loading structure in the 2001 CSO for a Male, Issue Age 35, Non-smoker risk.

The team first analyzed a flat 15% load (15% load at all issue ages and durations), but this simple structure resulted in margins that were too high at the oldest ages. The team ultimately proposed a graded percentage load that was highest at the lower attained ages and graded down at the higher attained ages. The graded load results in a per 1,000 load that generally increases by age even though the percentage load decreases by age. The graded load also results in a more intuitive pattern in load by age than other methods. Lastly, it is simple to understand, simple to administer for the numerous table variations, and will make it easier to maintain appropriate relationships between the various tables.

The graph below demonstrates the difference in loading structure and resulting margins between the 2001 CSO loading and that used for the 2017 CSO.
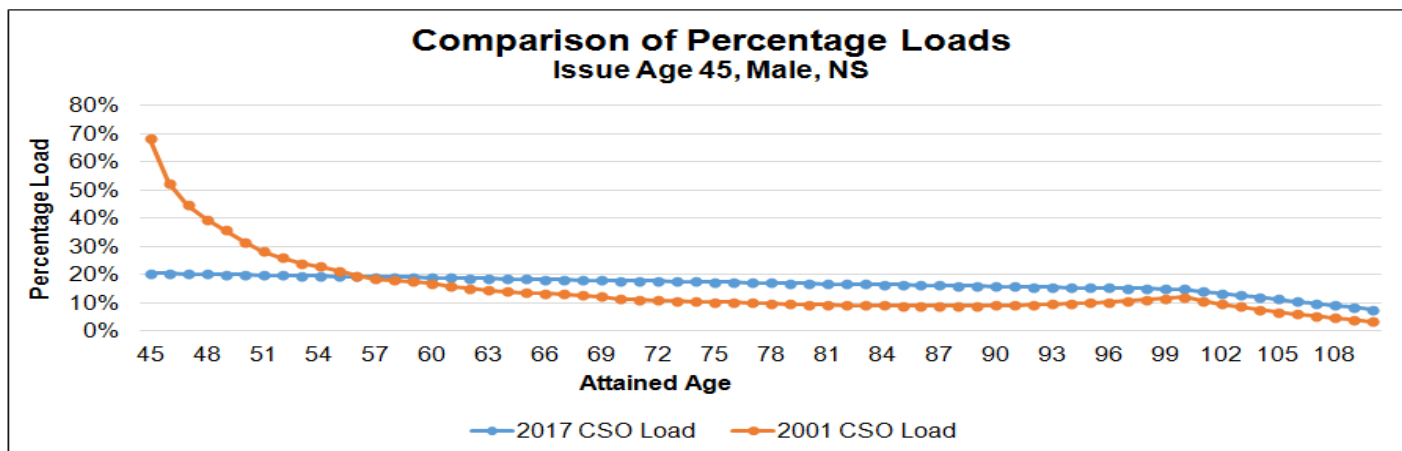
Development of Final Load and Coverage Testing

The final loading was developed by an iterative process whereby a load which varied by attained age was developed, applied to the underlying table, and actual-to-expected ratios were calculated for each of the 51 companies. Actual to expected ratios less than 100% meant that company's mortality experience was covered by the loaded table and that company contributed to the 70% company coverage objective. The expected basis used in the calculations was the pure experience table from the 2002-2009 data (rather than the 2015 VBT or the 2017 Unloaded CSO) so as to keep the expected basis in the denominator in line with the time period of the actual claims in the numerator.

This process was repeated until a load was found that the Joint Committee felt met the 70-79% guidance provided without being excessive in any one risk class grouping.

As a starting point, an initial graded load was developed that was roughly equivalent to the flat 15% load that the Joint Committee estimated to be necessary for 70% coverage. The initial trial loading was 18% at attained ages below 20 grading down to 12% at attained ages above 80. This load covered 70.6% of the companies in aggregate however the coverage was much less than 70% in many of the finer breakdowns by smoking status, gender, and issue age ranges.

The load was increased to 20% below age 20 grading down to 14% at attained age 80, further grading down to 12% by attained age 100 and to an ultimate load factor of 5% at attained ages 110 and above. This load again covered 70.6% of the companies in total but still did not have sufficient coverage in a majority of the finer breakdowns.

The load was further increased to 32% below age 20 grading down to 25% at attained age 80, further grading down to 23% by attained age 100 and to an ultimate load factor of 16% at attained ages 110 and above. While this load structure covered 82.4% of the companies in total and met the 70% minimum coverage directive in a vast majority of the results by issue age, gender, and smoking status, the Joint Committee believed this load was excessive averaging almost 30%.

The load was then reduced back to 26%, 20%, 18%, and 10% at ages 110 and above. The coverage tests continued to show coverage that was well above the 70-79% guidance.

The final load proposed by the Joint Committee was a loading factor of 23% below attained age 20, grading down to 16.85% at attained age 80, further grading down to 14.8% by attained age 100 and an ultimate load factor of 7.62% at attained ages 110 and above. This load provided the following coverage results:

- 70.6% of companies in aggregate;
- 72.5% of companies for males and 76.5% for females;
- 71.6% of the companies for male non-tobacco and 74.5% of the companies for female non-tobacco; and
- 74.5% of the companies for male tobacco and 78.4% for female tobacco.

The Joint Committee spent a significant amount of time reconciling the higher coverage seen at the finer breakdowns compared to the aggregate. Ultimately, it was found that the different distributions of business by the 51 companies caused different companies to be covered in the finer breakdowns compared to the companies covered in the aggregate.

As a final step in the process, the load was adjusted at attained ages 107 and above so that the final 2017 CSO table smoothly graded to 1,000 per 1,000 at attained age 120. This was necessary because the 2015 VBT and therefore, the 2017 Unloaded CSO table, have a mortality rate of 500 per 1,000 starting at attained age 112 with

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no omega age. The Joint Committee analyzed other ages to start grading from the mortality rate of 0.500 to 1.000 at attained age 120; however, starting at younger ages resulted in reserve patterns that were not smooth.

The final percentage loads by issue age and duration can be found in Appendix F - Percentage Load Factors. Note: the load factors in Appendix F represent the loads prior to the additional grading of the mortality rates to 1,000 per 1,000 between attained ages 107 and 120. The loads for these ages will be higher than those shown in Appendix F.

Loading the Preferred Structure Tables

The Joint Committee discussed whether the same load should apply to all five preferred structure tables or whether the preferred structure tables should have different loads for each table. The rationale for different loads is that a company must "qualify" to use the preferred structure table by demonstrating actual mortality that is less than the corresponding unloaded CSO table and the nature of the qualification process should reduce the volatility of potential mortality results, suggesting a smaller load. Another argument is that the resulting volatility of mortality in the residual class may be higher than the aggregate CSO, which suggests the potential for a higher loading factor.

However, the Joint Committee noted different loads for each table complicates the table construction.

Due to the complication of applying different loads for each table in ensuring appropriate relationships and monotonicity as well as meeting the company coverage targets, the Joint Committee recommended using the same percentage loads for both the 2017 CSO Table and each of the 2017 Preferred Structure CSO Tables.

Monotonicity Checks

Several monotonicity checks were performed on both the 2017 Unloaded and Loaded CSO Tables. The monotonicity checks resulted in some adjustments in rates although the number of cells needing adjustment was immaterial.   The following are the checks performed and the exceptions allowed in the final table.

1. $q_{[x+1]+t} > q_{[x]+t}$: some exceptions for all gender/smoking status combinations up through attained age 32.
2. $q_{[x]+t+1} > q_{[x]+t}$, : same exceptions as above.
3. $q_{[x]+t+1} > q_{[x+1]+t}$, : no exceptions.
4. $q^{Tobacco} >= q^{Composite} >= q^{Non\text{-}tobacco}$: no exceptions although equal rates were allowed for some age/duration combinations.
5. $q^{Male} >= q^{Female}$: no exceptions although equal rates allowed for some age/duration combinations.

Reserve Analysis

Appendices H and J compare CRVM reserves calculated using the 2001 CSO Table to the 2017 CSO Table and 2017 Unloaded CSO table for several issue ages, tobacco and non-tobacco, for a whole life plan and a 20-year level term product, respectively.

Whole life CRVM mean reserves were calculated using the tobacco distinct ultimate tables with an interest rate of 3.5% on a fully continuous basis. Twenty-year term Regulation XXX mean reserves were calculated using the select and ultimate preferred structure tables, using an interest rate of 4.5% on fully continuous basis. Deficiency reserves were ignored for these comparisons.

The tobacco distinct tables only contain mortality rates for issue ages 18 and above; therefore, ultimate rates on a tobacco/non-tobacco distinct basis only exist for attained ages 43 and above. In order to calculate reserves using the ultimate table at attained ages 42 and before, the issue age 18 rates starting at the appropriate duration

for the given age of calculation were used. For example, to calculate the whole life reserves for age 25, the mortality rates for issue age 18, durations eight and later were used.

For the cells analyzed, whole life reserves using the 2017 CSO are between 3% and 9% lower than those using the 2001 CSO for male, non-tobacco. Decreases are smaller at the higher issue ages and for male tobacco. Decreases are also smaller for females than for males.

Appendix I – Whole Life Net Single Premium Comparisons compares Net Single Premiums calculated under the 2017 CSO table to those calculated with the 2001 CSO table.

Level premium term products are expected to see larger decreases—25% for super preferred classes, 30% for preferred classes, and 45% for residual standard classes. These changes are a little higher at younger ages and a little lower for higher ages and tobacco. Some increases in reserves occur at higher issue ages. Lastly, the pattern of reserves is sometimes different with the proposed 2017 CSO compared to the 2001 CSO.

In order to do a more thorough analysis, the Society of Actuaries and ACLI jointly sponsored an impact study to conduct a more robust analysis of the impact of the change in the tables on a variety of products and to test the relationship of the reserves at different levels of aggregation (e.g., Composite versus NS/SM versus Preferred Structure Tables and Ultimate versus Select and Ultimate forms). The link to the final report on that impact study can be found here: http://www.soa.org/Research/Research-Projects/Life-Insurance/research-cso-impact-study.aspx.